

WHAT IS CLAIMED IS:

1. A liquid injection apparatus comprising:

an injection unit comprising a flow path formation portion, the flow path formation portion including a liquid discharge nozzle, one end of the liquid discharge nozzle being exposed to a liquid injection space, and a chamber communicating with the other end of the liquid discharge nozzle and with one end of a liquid feed pipe;

a drive voltage generation device for generating a drive voltage signal having a predetermined frequency; and

a pressurizing device comprising a discharge portion connected to the other end of the liquid feed pipe and an introduction portion communicating with a liquid storage tank, the pressurizing device being adapted to pressurize liquid introduced from the liquid storage tank through the introduction portion and to discharge the liquid under pressure from the discharge portion, so as to inject the liquid into the liquid injection space via the chamber and the liquid discharge nozzle of the injection unit;

wherein the injection unit further comprises a pressurizing portion, the pressurizing portion including a piezoelectric/electrostrictive element which has a fixation surface fixed to an outer surface of a wall of the chamber and receiving, via the wall, a force induced by liquid pressure in the chamber and which expands and contracts mainly in a direction along the fixation surface so as to deform the wall of the chamber for changing a volume of the chamber, and a counterforce application mechanism which applies to a nonfixation surface of the piezoelectric/electrostrictive element a counterforce directed toward the fixation surface; and

the injection unit is configured to cause the

piezoelectric/electrostrictive element to expand and contract based on the drive voltage signal issued from the drive voltage generation device, so as to atomize liquid injected from the liquid discharge nozzle.

2. A liquid injection apparatus according to claim 1, wherein the counterforce application mechanism is configured in such a manner as to adjust a magnitude of the counterforce such that a magnitude of a component of the counterforce, the component being directed in a deformation direction of the wall of the chamber, becomes substantially equal to a magnitude of a component of the force induced by liquid pressure in the chamber, the component being directed in the deformation direction of the wall of the chamber and imposed on the fixation surface.

3. A liquid injection apparatus according to claim 1, wherein the counterforce application mechanism comprises a counterforce source chamber into which liquid discharged from the discharge portion of the pressurizing device is introduced, and is configured such that a force induced by liquid pressure in the counterforce source chamber is applied, as the counterforce, to the nonfixation surface of the piezoelectric/electrostrictive element.

4. A liquid injection apparatus according to claim 2, wherein the counterforce application mechanism comprises a counterforce source chamber into which liquid discharged from the discharge portion of the pressurizing device is introduced, and is configured such that a force induced by liquid pressure in the counterforce source chamber is applied, as

the counterforce, to the nonfixation surface of the piezoelectric/electrostrictive element.